# THE GENERA OF ARALIACEAE IN THE SOUTHEASTERN UNITED STATES[1]

SHIRLEY A. GRAHAM

ARALIACEAE A. L. de Jussieu, Gen. Pl. 217. 1789, "Araliae," nom. cons.
(GINSENG FAMILY)

Perennial herbs, vines, shrubs [or trees, rarely scandent epiphytes]. Leaves alternate on the stem or basal from the rhizome, petiolate, [simple,] palmately compound or pinnately or ternately compound or decompound, the stipules either adnate (in varying degrees) to the base of the slightly sheathing petiole or wanting. Inflorescence basically umbellate, the umbels many flowered, solitary or arranged in panicles, racemes [corymbs, or rarely in compound umbels], the peduncles and pedicels subtended by lanceolate, deciduous or persistent bracts. Flowers regular, bisexual and/or unisexual, the plants polygamomonoecious, polygamodioecious, or dioecious. Floral tube adnate to the ovary, cupuliform, obconic, or cylindrical, articulated or continuous with the pedicel; calyx lobes 5, small, deltoid [or the apex of the floral tube merely undulate], persistent. Petals 5[–10], valvate or imbricate in bud, broad [or narrow] at base, greenish white to pink, arising from the margin of a fleshy, epigynous, flattened or cupuliform nectariferous disc, free and separately deciduous or ± connate and falling as a unit. Stamens 5 [to many], generally as many as the petals and alternate with them, inserted epigynously; filaments filiform [or ligulate]; anthers oblong [to subglobose], dorsifixed, versatile, 2-locular, longitudinally dehiscent; pollen usually 30–40 $\mu$ long, oblate-spheroid [to prolate], 3-colporate, the pores often transversely elongated, the exine reticulate. Gynoecium 2–5(6)[–15]-carpellate, syncarpous; styles persistent, generally as many as the carpels, distinct or

[1] Prepared for a generic flora of the southeastern United States, a joint project of the Arnold Arboretum and the Gray Herbarium of Harvard University made possible through the support of George R. Cooley and the National Science Foundation and under the direction of Carroll E. Wood, Jr., and Reed C. Rollins. The treatment follows the pattern established in the first paper in the series (Jour. Arnold Arb. **39**: 296–346. 1958) and continued to the present paper. The area covered includes North and South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, and Louisiana. The descriptions apply primarily to the plants of this area, with supplementary information in brackets. References not seen by the author are marked with an asterisk.

The author is indebted to Dr. Lily M. Perry for references to Chinese medicinal uses of *Panax* and to Dr. Wood for his generous assistance and suggestions. Harry E. Ahles and Wilbur H. Duncan have kindly contributed information on *Hedera* in the Carolinas and Georgia, respectively.

united for a short distance above the disc [or completely united into a cone or column, or rarely wanting and the stigmata sessile]; stigmatic surfaces terminal and/or along the adaxial surface of each style; ovary inferior, 2–5(6)[–15]-locular, the wall adnate to the floral tube, the apex fused to the disc; ovules 2–5(6)[–15], one in each locule, anatropous, epitropous, pendulous, the raphe ventral, the placentation axile. Fruit a subglobose [or ellipsoid], sulcate [or smooth] drupe, bearing the persistent styles and calyx lobes; exocarp thin, this and the fleshy mesocarp drying to a membranaceous covering holding together the 2–5(6)[–15] oblong, laterally flattened [or globose] stones (pyrenes) [in one genus the fruit dry and the carpels partly separating]. Seeds with thin seed coat; endosperm abundant, uniform [or ruminate]; embryo straight, in the micropylar end of seed, minute at maturity of seed, the radicle superior. TYPE GENUS: *Aralia* L.

A predominantly woody family of about 60 genera and 750 species, with the two major centers of speciation, tropical America and Indo-Malaya, sharing few genera; represented in the southeastern United States by *Aralia* and *Panax*, both of eastern American-eastern Asiatic distribution, and possibly by the introduced *Hedera Helix* L.[2]

The familial classification generally followed is that of Harms, who divided the group on the basis of somewhat unsatisfactory characters of aestivation and shape of petals into three tribes: Schefflereae (petals with a broad base, valvate in bud), Aralieae (petals with a broad base, ± imbricate in bud), and Mackinlayeae (petals narrowed at the base, valvate in bud). Viguier later recognized ten tribes (invalidly published) based mainly on anatomical characters. No modern treatment is available for the whole family, and few of the genera have been monographed, making it necessary to rely almost solely on regional treatments for determination of species and information regarding their biology.

The Araliaceae are closely allied to the Umbelliferae, but the latter differ in being chiefly herbaceous and in possessing consistently bicarpellate dry fruits, the carpels of which separate at maturity. Anatomically, the two families are very similar. The Araliaceae are notable for secretory canals in the pith, phloem, and cortex, the distribution of which is valuable in identifying the species and, to a more limited extent, in recognizing the genera. The pollen of Araliaceae is similar to that of the Umbelliferae and Cornaceae.

In a study of some woody Umbellales, Rodriguez (p. 276) has sum-

[2] *Oplopanax horridus* (J. E. Sm.) Miq., which ranges from Alaska, south to California, and east to Montana, with disjunct stations in the Thunder Bay District, Ontario, and Isle Royale, Michigan, has recently been reported in an ecological study from the Coastal Plain of South Carolina (Bull. Torrey Bot. Club **92**: 357, 363. 1965). The South Carolina plant is undoubtedly *Aralia spinosa*, not *Oplopanax horridus*. *Aralia spinosa* is common in South Carolina, while the easternmost station for *Oplopanax* is more than a thousand miles away. It seems likely that a confusion in common names ("devil's club" vs. "devil's walking stick") led to the misidentification. — C. E. W.

marized what he believes is the relationship of the Araliaceae to related families: "Although the Umbelliferae form highly specialized expressions of characters already present in the Araliaceae, no linear phylogenetic sequence involving existing genera may be postulated. *Myodocarpus* [a small araliaceous genus endemic to the serpentine massifs of New Caledonia], whose fruit approximates most that of the Umbelliferae, resembles rather the Cornaceae in its wood anatomy. Both families, Umbelliferae and Araliaceae, apparently diverged from a single ancestral source. Of the tribes of Araliaceae, the Mackinlayineae [Mackinlayeae Harms] appear to be closest to the Umbelliferae on anatomical grounds. The information available on Cornaceae, Nyssaceae, and Garryaceae does not conflict with the assumption that they too may be divergent offshoots of the same source. Within the complex of families, the Umbelliferae are the most advanced in habit, fruit type, and secondary-xylem characteristics; the Garryaceae are the most advanced in flower morphology; the Araliaceae occupy a wide central position bridging the distance between those advanced families and the more primitive Cornaceae and Nyssaceae."

The fossil record of Araliaceae, represented by leaves and pollen of several genera, is extensive. Leaves of *Aralia* and *Hedera* are reported from the Upper Cretaceous and Palaeocene of Alaska, far north of their present ranges. *Panax* is reported from the Oligocene of Colorado, and the tropical American *Oreopanax* Dec. & Planch. has been recorded from the Eocene of Tennessee, Mississippi, Arkansas, and Texas, and the Miocene of Oregon. Another tropical genus, *Schefflera* J. F. & G. Forst., has been reported from the Eocene of Tennessee and Kentucky. The Cretaceous occurrence of members of the Araliaceae places it among the oldest known angiosperm families.

Chromosome numbers of $2n = 22$, 24, 44, 48, ca. 54, 96, ca. 127, and 192 have been reported, the most frequent numbers being $2n = 24$ and 28.

The family is of little economic importance. Rice paper, a soft, velvety material which finds limited use in the manufacture of artificial flowers, is the thinly sliced pith of *Tetrapanax papyriferus* (Hook.) K. Koch, a monotypic genus from Formosa and China. Roots of *Panax* are valued in China for medicinal use. About 28 genera are cultivated as ornamentals in the United States.

The European ivy, *Hedera Helix* L., widely cultivated in eastern North America, is known to reproduce vegetatively to some degree as a waif around dumping places in scattered parts of the southeastern United States. In some areas of southeastern Virginia it appears to be truly naturalized, but it is uncertain whether this is so elsewhere and whether it ever spreads by seeds. Both the vars. *Helix*, $2n = 48$, and *hibernica* (Kirchn.) Jaeger, $2n = 96$, are said to be "naturalized in wooded areas of Virginia and North Carolina" (Lawrence). *Hedera Helix* is easily distinguished from other species by its 4–10-rayed stellate hairs; in the four other species the hairs are scaly or scalelike. *Hedera* is of special morphological interest because of its distinctive juvenile and adult forms, the unbranched juvenile stems climbing by adventitious rootlets and bearing lobed leaves lying in a single plane, in contrast with the nonclimbing,

branched and shrubby adult flowering stems with their unlobed leaves circling the stem. The leaves of juvenile stems are necessary for the determination of varieties, for within a given species of *Hedera* the leaves of adult stems do not show similar variation. The juvenile leaves of *H. Helix* var. *Helix* are rarely more than 6 cm. long, dark green with prominently whitish veins above; those of var. *hibernica* are glossier and larger (to 13 cm.) with green venation above. A number of references dealing with *Hedera* have been included with the family references.

REFERENCES:


BAILLON, H. Ombellifères. Hist. Pl. **7**: 84–256. 1879. [Araliaceae, as tribe Aralieae, 151–170, 175, 244–256.]

BAUMANN, M. G. *Myodocarpus* und die Phylogenie der Umbelliferen-Frucht. Umbellifloren-Studien I. Bull. Soc. Bot. Suisse **56**: 13–112. *6 pls.* 1946.

BAUMANN-BODENHEIM, M. G. Ableitung und Bau bicarpellat-monospermer und pseudomonocarpellater Araliaceen- und Umbelliferen-Früchte. (English summary.) *Ibid.* **65**: 481–510. 1955. ["The majority of these fruits (of Araliaceae) are either pentacarpellate or bicarpellate, homocarpellate, isospermous, clausicarpous stratocapsulae. . . . with the Umbelliferae in the form of bicarpellate and homocarpellate, isospermous, carpelli-squamicidal, mericleistocarpous stratocapsulae with isolation of a protomericarpophor or a mericarpophore"!]

BENTHAM, G., & J. D. HOOKER. Araliaceae. Gen. Pl. **1**: 931–947. 1867.

CANDOLLE, A. P. DE. Araliaceae. Prodr. **4**: 251–266. 1830.

DUCAMP, L. Recherches sur l'embryogénie des Araliacées. Ann. Sci. Nat. Bot. VIII. **15**: 311–402. *pls. 6–13.* 1902.

GÜSSOW, F. Beiträge zur vergleichenden Anatomie der Araliaceae. Inaug.-diss. 67 pp. *pl. 1.* Breslau. 1900.*

HARMS, H. Araliaceae. Nat. Pflanzenfam. III. **8**: 1–62. 1894/1897.

———. Zur Kenntnis der Gattungen *Aralia* und *Panax*. Bot. Jahrb. **23**: 1–23. 1896.

HOLM, T. Medicinal plants of North America no. 97. Merck's Rep. **25**: 11–15, 62–65, 126–130, 177–180. 1916; **26**: 6–8. 1917.* [*Aralia* and *Panax*.]

JACOBSEN, P. Chromosome numbers in the genus *Hedera* L. (Abstr.) Hereditas **40**: 252–254. 1954.

JOHANSEN, D. A. Plant embryology. Embryogeny of the spermatophyta. xvi + 305 pp. Waltham, Mass. 1950. [Araliaceae, 204, 205.]

LAMOTTE, R. S. Catalogue of the Cenozoic plants of North America through 1950. Geol. Soc. Am. Mem. **51.** 381 pp. 1952. [*Aralia*, 71, 72; *Hedera*, 182; *Oreopanax*, 236; *Panax*, 242; *Schefflera*, 323.]

LAWRENCE, G. H. M. The cultivated ivies. Morris Arb. Bull. **7**: 19–31. 1956. [*Hedera*; includes keys to spp. and cultivars.]

———. The cultivated genera of Araliaceae. Baileya **7**: 133–140. 1959. [Includes key to 28 genera with leaf of each genus illustrated.]

——— & A. E. SCHULZE. The cultivated hederas. Gent. Herb. **6**: 106–173. 1942. [Key to and taxonomy of the 5 cultivated spp.; *H. Helix* with 38 vars.]

LI, H. L. The Araliaceae of China. Sargentia **2**: 1–134. 1942. [*Hedera*, 49–51; *Aralia*, 101–116; *Panax*, 116–119.]

MEEHAN, T. On the flowers of *Aralia spinosa* L. and *Hedera Helix* L. Ann. Mag. Nat. Hist. IV. **7**: 315, 316. 1871.*

METCALFE, C. R., & L. CHALK. Araliaceae. Anat. Dicot. **2**: 725–735. 1950.

MITTAL, S. P. Studies in the Umbellales. II. The vegetative anatomy. Jour. Indian Bot. Soc. **40:** 424–443. 1961. [Nodal anatomy in some genera of Araliaceae, Umbelliferae, and Cornaceae, and consideration of the relationship of these families.]

MÜLLER, C. Ueber phloëmständige Secretkanäle der Umbelliferen und Araliaceen. Ber. Deutsch. Bot. Ges. **6:** 20–32. 1888.

NAKAI, T. Araliaceae Imperii Japonici. Jour. Arnold Arb. **5:** 1–36. 1924. [*Hedera*, 24–27; *Aralia*, 27–32; *Panax*, 32–36.]

PERDUE, R. E., & C. J. KRAEBEL. The rice-paper plant — *Tetrapanax papyriferum* (Hook.) Koch. Econ. Bot. **15:** 165–179. 1961.

ROBBINS, W. J. Further observations on juvenile and adult *Hedera*. Am. Jour. Bot. **47:** 485–491. 1960. [Juvenile and adult foliage.]

RODRIGUEZ, R. L. Systematic anatomical studies on *Myrrhidendron* and other woody Umbellales. Univ. Calif. Publ. Bot. **29:** 145–318. *pls. 36–47*. 1957.

SEEMANN, B. Revision of the natural order Hederaceae. 107 pp. *7 pls.* London. 1868. [See also Jour. Bot. **2–6.** 1864–1868.]

SMITH, A. C. Araliaceae. N. Am. Fl. **28B:** 3–41. 1944. [Nine genera; *Aralia*, 4–7; *Panax*, 9, 10. See also notes in Brittonia **2:** 247–261. 1936.]

VIGUIER, R. Recherches anatomiques sur la classification des Araliacées. Ann. Sci. Nat. Bot. IX. **4:** 1–210. 1906.

———. Nouvelles recherches sur les Araliacées. *Ibid.* **9:** 305–405. 1909. [*Aralia, Acanthopanax, Schefflera, Dizygotheca.*]

WEISSE, A. Blattstellungsstudien an *Hedera Helix*. I. Plagiotrope Sprosse und Sämlinge. Ber. Deutsch. Bot. Ges. **42:** 391–396. 1924; II. Orthotrope Sprosse und Blütenstand. *Ibid.* **43:** 11–15. 1925.

YOUNG, R. A. Fatshedera. Natl. Hort. Mag. **17:** 81–83. 1938. [Supposedly an intergeneric hybrid between *Fatsia japonica* var. *Moseri* and *Hedera Helix* var. *hibernica*.]

## KEY TO THE GENERA OF ARALIACEAE

General characters: *perennial herbs, shrubs, trees, or vines with alternate, often compound or decompound leaves; inflorescence basically an umbel; flowers regular, generally 5-merous; ovary inferior, the ovules solitary and pendulous in each locule; fruit a drupe, with 2–5 or more oblong stones.*

A. Leaves simple, lobed or entire; vines climbing by adventitious roots. . . . . [*Hedera.*]

A. Leaves compound; perennial herbs or shrubs to small trees.

B. Leaves ternately or pinnately compound or decompound, alternate or basal; inflorescence of 2 to many umbels; fruit purple or black. . . . . 1. *Aralia.*

B. Leaves palmately compound, whorled at the summit of the stem; inflorescence a solitary umbel; fruit red or yellow. . . . . 2. *Panax.*

### Tribe ARALIEAE

**1. Aralia** Linnaeus, Sp. Pl. 1: 273. 1753; Gen. Pl. ed. 5. 134. 1754.

Glabrous or spinescent perennial herbs, shrubs, or small trees, with stout, elongate rhizomes, our species generally inhabiting rich, moist woods. Leaves alternate on stem or (in acaulescent species) arising directly

from rhizome; petiole broad at base and partially fused with stipules, glabrous or with prickles; blade pinnately or ternately compound or decompound, the leaflets composing each pinna 3 to many, ovate to lanceolate-elliptic [or orbicular], obliquely cordate to acute or rounded at base, acute to acuminate at tip, glabrous [to densely pubescent], the margin finely to coarsely serrate or biserrate. Inflorescence axillary, terminal, or basal, the umbels solitary or paniculate [rarely compound]. Flowers 5-merous, bisexual and/or unisexual, the plants reportedly polygamomonoecious or dioecious [or polygamodioecious]. Floral tube cupuliform, obconic, or cylindrical, articulated with pedicel; pedicel slightly swollen at apex beneath flower and bearing small involucral bracts. Petals greenish white, oblong, the apex inflexed, valvate to slightly imbricate in bud, arising from the margin of the flattened disc, separately deciduous. Stamens introrse in bud; filaments long in ♂ flowers, short in ♀ flowers. Gynoecium (2–)5(6)-carpellate; styles (2–)5 (6), completely free or connate for a short distance above the disc, much shorter than stamens in ♂ flowers, much longer in ♀ flowers; stigmatic surfaces terminal; ovary inferior, (2–)5(6)-locular, each locule with a single ovule. Fruit a subglobose purple to black drupe with (2–)5 (6) oblong, laterally flattened stones. LECTOTYPE SPECIES: *A. racemosa* L.; see N. L. Britton, N. Am. Trees 733. 1908. (Etymology of name obscure; adopted by Linnaeus from Tournefort, who first received seeds of a plant bearing this name from Holland [Elemens Bot. 1: 249. 1694]. According to Fr. Marie-Victorin [Fl. Laurent. 411. 1947], the name is of American Indian origin [perhaps Iroquoian, *fide* Webster's New Int. Dict. ed. 2. 1959] and was communicated to Tournefort by the Quebec physician Sarrazin.)

A genus of about 30 species in six sections, with eight species indigenous to North America, the remainder in Asia and Malesia. Three, perhaps four, species range into the Southeast, the most widespread being *Aralia spinosa* L. (sect. ARBORESCENTES Harms), $2n = 24$, a shrub or small tree with stout, often curved prickles, bipinnate leaves up to 75 cm. long, and a showy, compound terminal panicle of umbels. Popularly known as Hercules' club or devil's walking stick, it occurs locally throughout our area, except in southern Florida, in and along edges of damp woods. It is occasionally cultivated for the somewhat tropical appearance of its leaves and inflorescence. *Aralia racemosa* L. (sect. ARALIA, § *Genuinae* Harms), spikenard, widely distributed outside the southeastern United States, is known or reported from scattered counties in Tennessee, North and South Carolina, and northern Georgia, Alabama, and Mississippi. The plant is an unarmed perennial herb with bipinnate leaves, the lower pinnae having more leaflets than the upper ones, and a compound, paniculate, terminal inflorescence. The dried rhizomes have been used, without medical basis, as a home remedy in the treatment of rheumatic fever, syphilis, and dermatoses. *Aralia nudicaulis* L. (sect. NANAE Harms), wild sarsaparilla, $2n = 24$, of northern, almost transcontinental, distribution, but with a southern extension through the Blue Ridge physiographic prov-

ince to northern Georgia, is easily recognized by its glabrous, acaulescent habit; ternately divided leaves, the pinnae of which are 3–5-foliolate; and scapose inflorescence. A fourth species, *A. hispida* Vent. (sect. HUMILES Harms), is reported in various floras as extending south in the mountains to North Carolina, but its presence there has not been confirmed. It is known with certainty as far south as Augusta County, Virginia, and Pocahontas County, West Virginia. A perennial herb, it is densely bristly, especially near the base, and produces several short, clustered stems from a stout horizontal rhizome.

Twenty-five fossil species of *Aralia* have been described from the Tertiary of North America, several from areas no longer within the range of the genus. Leaves have also been reported from the Upper Cretaceous (see family discussion).

REFERENCES:

Under family references see HARMS (1896), HOLM, LAMOTTE, LI, MEEHAN, NAKAI, SMITH, and VIGUIER (1906, 1909).

ALPERS, W. C. The oil and terpenes of *Aralia nudicaulis*. Am. Jour. Pharm. **71**: 370–378. 1899.

BERRY, E. W. *Aralia* in American palaeobotany. Bot. Gaz. **36**: 421–428. 1903. [Known fossil record of *Aralia* leaves; see also Bull. Torrey Bot. Club **37**: 27, 28. 1910.]

DAVIES, P. A. Origin and development of prickles of *Aralia spinosa*. Trans. Ky. Acad. Sci. **10**: 29. 1942.

HAAR, A. W. VAN DER. Beitrag zur Anatomie der Araliaceae. Die Blätter und Stengel von *Aralia montana* Bl. Rec. Trav. Bot. Néerl. **19**: 277–280. *pl. 9*. 1922.

HOLM, T. Contributions to the knowledge of the germination of some North American plants. Mem. Torrey Bot. Club **2**: 57–108. *pls. 5–19*. 1891. [*A. spinosa*, 75, *pl. 11*, *fig. 75*.]

SARGENT, C. S. *Aralia*. Silva N. Am. **5**: 57–62. *pl. 211*. 1893. [*A. spinosa*.]

2. **Panax** Linnaeus, Sp. Pl. **2**: 1058. 1753; Gen. Pl. ed. 5. 481. 1754.

Perennial herbs of moist, rich woods; stem unbranched, erect, arising from a short rhizome and an elongate, often branched, or globose, unbranched tuberous root; base of stem subtended by a few membranaceous [or fleshy], deciduous [or persistent] scales. Leaves 1–5, generally 3, in a single whorl at summit of stem, palmately compound, membranaceous, exstipulate, subtended by a narrow, lanceolate bract; leaflets 3–5, mostly 5, petiolulate or sessile, glabrous or with sparse [to dense] setae along the veins on the upper (adaxial) surface, narrowly elliptic to obovate, the base acute to rounded, the apex acute to long acuminate or obtuse, the margin coarsely to finely serrate or biserrate. Inflorescence a single long-peduncled, terminal umbel of many flowers [rarely 2–6 umbels arising at irregular intervals along the peduncle], the pedicels subtended by lanceolate bracts. Flowers bisexual and/or unisexual, the plants hermaphroditic or polygamodioecious (reportedly also polygamomonoecious). Floral tube obconical or cylindrical, articulated with the pedicel in bisexual and

♀ flowers, continuous in ♂ flowers; pedicel slightly swollen at the apex beneath the flower in all but the ♂ flowers; lobes of the calyx 5, broadly deltoid, small to minute. Petals greenish white to white or pink, oblong or broadly ovate, slightly imbricate in bud, arising from the margin of the cupuliform nectariferous disc, generally separately deciduous, occasionally coherent and falling together. Stamens wanting in ♀ flowers. Gynoecium 2- or 3-carpellate, reduced to a single column in ♂ flowers; styles 2 or 3 (in bisexual and ♀ flowers only), arising from the center of the disc, free to the base or slightly united, the apices and adaxial surfaces stigmatic; ovary 2- or 3-locular, generally wanting in ♂ flowers; ovules 2 or 3. Fruit a red or yellow, subglobose, 2- or 3-sulcate drupe with 2 or 3 oblong, laterally flattened [or globose] stones. LECTOTYPE SPECIES: *P. quinquefolius* L.; see Britton & Brown, Illus. Fl. No. U. S. ed. 2. **2**: 618. 1913. (Name Greek and Latin, *panax* [= panacea], an herb to which was ascribed the power to heal all diseases, from Greek, *panakes*, all-healing.[3])

An eastern American-eastern Asiatic genus of about seven species, the two American species occurring in our area. *Panax trifolius* L., dwarf ginseng, usually not over 20 cm. tall, with a globose root, sessile leaflets, often unisexual flowers, three styles, and yellow fruits, extends southward along the mountains from Quebec into Tennessee, North Carolina, and northern Georgia. *Panax quinquefolius*, ginseng, 20–60 cm. tall, with a fusiform root, petiolulate leaflets, mostly bisexual flowers, two styles, and red fruits, ranges from Quebec to Minnesota, south to Oklahoma and Georgia, but has become rare in the wild because of exportation of its tuberous roots to China, where they are esteemed for their reputed curative powers.

The closely related Asiatic *Panax Ginseng* C. A. Meyer (*P. Schin-seng* T. F. L. Nees),[4] $2n = 44$, has been used for centuries by the Chinese, who believe the resemblance of the roots to the human figure signifies their power to cure illnesses. The common name in China, "schin-seng," "jen-seng," or "ginseng," means "essence of the earth in the form of a man."

The first description of ginseng by a European was published in 1714 by Père Jartoux, a missionary in China. Soon afterward, Père Lafitau, a missionary among the Iroquois in Quebec, found a similar plant (*Panax quinquefolius*) growing at Montreal. Exports of the dried roots to China

[3] A number of recent authors have treated *Panax* and its compounds (e.g., *Dendropanax*, *Oplopanax*, *Tetrapanax*) as neuter instead of masculine, contrary to Recommendation 75A of the International Code of Botanical Nomenclature (1961). The classical gender of *Panax* is masculine in both Greek and Latin; it is immaterial that Linnaeus treated it as neuter. See A. C. Smith's pertinent comments in N. Am. Fl. **28B**: 9. 1944.

[4] Although *Panax Schin-seng* T. F. L. Nees (Ic. Pl. Medicinal. fasc. 5, *pl. 16.* [conspectus *pl. 70.*] 1833) has been widely used for this species, this name was superfluous when published, for *P. Schin-seng* expressly included the earlier and legitimate *P. pseudoginseng* Wallich (Pl. Asiat. Rar. **2**: 30. *pl. 137.* 1831) *Panax Schinseng* is thus illegitimate under Art. 63 of the International Code. The earliest legitimate name available is *P. Ginseng* C. A. Meyer (Bull. Phys.-Math. Acad. Sci. St.-Pétersb. II. **1**: 340. 1843).

soon began, probably at first by way of France or England, but later directly from northeastern American ports. In 1860, alone, 600,000 lbs. of dried roots of *P. quinquefolius* were exported to China; in 1886, the value of exported roots was $998,332 (Butz). The export of ginseng has greatly declined since World War II, but even in 1957 approximately 100,000 lbs. were shipped, mainly to Hong Kong, with collectors or growers receiving 20–24 dollars a pound for wild roots and some 40 per cent less for cultivated roots (Williams). Populations of wild ginseng have been greatly depleted in the eastern United States by "sang" (a contraction of ginseng) diggers who dig the roots in the spring and summer before the plant produces seeds. Cultivation of the species has been attempted, but *Alternaria* blight and other fungal diseases have discouraged many growers. Today there are relatively few growers; the largest is Fromm Bros., Inc., with about 100 acres under cultivation in Hamburg, Wisconsin.

Originally, the most valuable roots were those of *Panax Ginseng* grown in Chinese imperial gardens. Now the most valuable are those from Manchuria and Korea, the roots of the American *P. quinquefolius* and the Japanese *P. japonicus* (T. F. L. Nees) C. A. Meyer (*P. Ginseng* var. *japonicus* (T. F. L. Nees) Makino) being considered less effective. Now rare in the wild as a result of collecting, ginseng is currently being cultivated in both Korea and Manchuria. *Panax Ginseng* is grown from seeds which are collected in the fall when the embryo is not yet completely developed. Seeds must be stored for a year under moist conditions, with a three- to four-month cold period during which the embryo lengthens from 0.3 to 4.5 mm., and the surrounding endocarp splits along one suture. The stratified seeds are sown the following fall for germination in the spring. Five or six years' growth is required before flowering begins.

The germination and maturation of *Panax quinquefolius* is apparently similar to that of *P. Ginseng*. Characters used to distinguish the species pair are minor: the slope of the base of the leaflets and the degree of persistence of the fleshy or membranaceous scales at the base of the stem.

The root, generally ground to a powder and made into a tea, is said to have a stimulating effect, enhancing digestion, blood circulation, and sexual desires, and is believed by users to be valuable in treating fatigue, nervous disorders, and blood diseases. At present there is little sound evidence that the constituents of the roots (which seem to be approximately the same in the American and Asian species) act as more than a mild stimulant. The major components are a glucoside, panaquilon; a saponin, panaxine; and a volatile oil, panacen. In addition, the roots contain mucilage, resin, a hormone of the steroid group, and vitamins $B_1$ and $B_2$.

REFERENCES:

Under family references see HARMS (1896), LAMOTTE, LI, NAKAI, SMITH, and VIGUIER (1906).

ANONYMOUS. American ginseng (*Aralia quinquefolia*, A. Gray). Bull. Misc. Inf. Kew **1893**: 71–75. 1893.

BALANDIN, D. A. The chemical composition of *Panax Ginseng*. A survey of the literature. (In Russian.) Mater. Izuch. Zhen'-Shenia Limonnika **2:** 77–96. *1 pl.* 1955.* [Monographic survey.]

BRYANT, G. The wildcrafters ginseng manual; a guide to American ginseng. 40 pp. Terre Haute, Indiana. 1949.*

BUCH, T. G. The physiology of seed germination in ginseng. (In Russian.) Bull. Glavn. Bot. Sada Moskva **20:** 109–114. 1955.

BUTZ, G. C. The cultivation of American ginseng in Pennsylvania. Pa. Dep. Agr. Bull. **27:** 1–24. 1897.

CHANG, Y. L. The cultivation of *Panax Schin-seng* Nees v. Esenb. at the foot of Changpaishan Mountain (southeastern Manchuria). Acta Soc. Harbin. Invest. Nat. Ethnogr. **12:** 39–42. 1954. [*P. Ginseng*.]

ESDORN, I. Die Ginsengwurzel auf dem heutigen Drogenmarkt. Pharmazie **15** (2): 75–81. 1960. [Includes morphology and anatomy of root.]

GRUNDULS, J. Ginseng, the root of life. (In Norwegian; English summary.) Blyttia **15:** 90–94. 1957. [An account of ginseng diggers in Manchuria.]

GRUSHVITZKY, I. V. "Contractile roots" — an important biological characteristic of *Panax Ginseng* C. A. M. (In Russian.) Bot. Zhur. **37:** 682–685. 1952.

———. *Panax Ginseng* C. A. Mey. — the real name of ginseng. (In Russian.) Mater. Izuch. Zhen'-Shenia Limonnika **2:** 13–18. 1955.*

———. The diseases of *Panax Ginseng*. A survey of the literature. (In Russian.) *Ibid.* 35–70. *figs. 1–25.**

———. Instructions for developing measures of accelerated germination of ginseng seeds. (In Russian.) Bot. Zhur. **41:** 1021–1023. 1956. [*P. Ginseng*.]

———. A contribution to the knowledge of biology of the wild-growing ginseng (*Panax Ginseng* C. A. M.). (In Russian; English summary.) *Ibid.* **44:** 1694–1703. 1959. [Brief life-history.]

——— & L. M. NOVICHKOVA. A contribution to the knowledge of photosynthesis in the ginseng. (In Russian.) Bot. Zhur. **42:** 751–756. 1957. [*P. Ginseng*.]

HARDING, A. R. Ginseng and other medicinal plants. 367 pp. Columbus, Ohio. 1908. [*P. quinquefolius*, 1–190.]

HÖRHAMMER, L., H. WAGNER, & B. LAY. Zur Kenntnis der Inhaltsstoffe von Radix *Panax Ginseng* C. A. Meyer. (Vorläufige Mitteilung.) Pharm. Zeit. Berlin **106:** 1307, 1308, 1310, 1311. 1961.

ICHIMURA, T. On the anatomy of the seed of *Aralia quinquefolia* var. *Ginseng*. (In Japanese.) Bot. Mag. Tokyo **9:** 131–134. 1895.

JOHNSON, M. C. Our most valuable native plant, *Panax quinquefolius*. Castanea **25:** 132–134. 1960. [Popular account of the sp. and terminology applied to its parts by the mountaineers who dig it.]

MARAKUEV, A. V. Ginseng in scientific and popular literature (1596–1932). (In Russian; English summary.) Vestn. Dal'nevost. Fil. Akad. Nauk SSSR (Bull. Far East. Branch Acad. Sci. USSR) **1932:** 37–47. 1932. [A digest of the literature.]

MOSIG, A., & G. SCHRAMM. Der Arzneipflanzen- und Drogenschatz Chinas und die Bedeutung des Pên-Ts'ao Kang-Mu. Beih. Pharmazie. Heft 4. 71 pp. Berlin. 1955. [Lists constituents of roots of *P. Ginseng*, 53, 54.]

PETROVSKAYA-BARANOVA, T. P. An embryological investigation of ginseng. (In Russian; English summary.) Trudy Glavn. Bot. Sada Moskva **6:** 211–225. 1959.*

POJARKOVA, A. De *Ginseng* nomine botanico legitimo. (In Russian.) Not. Syst. Leningrad **12:** 196, 197. 1950. [Maintains *P. Schin-seng* Nees is correct.]

SIMS, J. *Panax quinquefolia.* Bot. Mag. **33:** *pl. 1333.* 1811.

———. *Panax pusilla. Ibid. pl. 1334.* [*P. trifolius.*]

STUART, G. A. Chinese *Materia Medica.* Vegetable kingdom. iv + 558 pp. + vi. Shanghai. 1911. [Chinese uses of *P. Ginseng*, 301–304.]

TAKAHASHI, N., & T. OSUMI. On the inheritance of the colour of stem and fruit in *Panax Ginseng,* C. A. Meyer. (In Japanese.) Jap. Jour. Genet. **16:** 273–276. 1940.

VAN HOOK, J. S. Diseases of ginseng. Cornell Agr. Exp. Sta. Bull. **219:** 163–186. 1904.

VASSILCHENKO, I. T. On the germination of *Panax Ginseng* C. A. M. seeds. (In Russian; English summary.) Bot. Zhur. **20:** 242–244. 1935.

WHETZEL, H. H., & J. ROSENBAUM. The diseases of ginseng and their control. U. S. Dep. Agr. Bur. Pl. Ind. Bull. **250:** 1–44. *pls. 1–12.* 1912.

WILLIAMS, L. O. Ginseng. Econ. Bot. **11:** 344–348. 1957. [*P. Ginseng, P. quinquefolius.*]

U. S. DEP. AGR. Ginseng (*Panax quinquefolium*) culture. (Revised.) U. S. Dep. Agr. Farmers' Bull. **1184.** 13 pp. 1953.

WONG, Y. C. The constituents of the roots of American ginseng. Jour. Am. Pharm. Assoc. **10:** 431–437. 1921.* [*P. quinquefolius.*]

ARNOLD ARBORETUM
AND
GRAY HERBARIUM

Present address: DEPARTMENT OF BIOLOGY
UNIVERSITY OF AKRON
AKRON, OHIO